DEMO CIRCUIT 1256A
QUICK START GUIDE

LTC4012-2
MULTI CELL LI-ION BATTERY CHARGER BOARD

DESCRIPTION

Demonstration circuit DC1256A is a single-battery stand-alone battery charger that can support any version of the LTC4012 family of parts. The LTC4012 family of charge controller IC's do not support charge termination for any specific battery chemistry. Any charger termination, if necessary, is accomplished outside the LTC4012 with the most common method using a microcontroller. The DC1256A is shipped with the LTC4012-2 installed, which is optimized for Li-ion charge applications using a 4.2V/Cell float voltage. The charger output voltage is programmed by jumpers to support 1, 2, 3 and 4 series stack Li-ion batteries. The input voltage is can be between 6V and 20V with the maximum voltage of the Demoboard design limited by the input capacitor voltage ratings. To reach full charge, the minimum input voltage must be greater than the float voltage setting. For optimal operation, Vin needs to be about 1.5V higher than the float voltage for fastest charge times. No matter what, the input voltage must be 6V minimum for the IC to work at all. The maximum charge current of the design is 3A. The Demoboard is shipped configured for 12.6V Li-ion batteries using a 15V to 20V input. By default, the charger will turn on with input power. However, if JP7 is set to the THM position, the power state will be determined by the physical presence of a battery on the battery connector. As designed, it is compatible with Smart Batteries where a dedicated pin is used to indicate battery presence. A standard battery can and should use the same idea. Status LEDs are provided for CHG, ACP, C/10, and ICL. DC1256A also optionally includes an efficient battery discharge path via Q11. This circuit automatically turns on when Vin goes below the Vbat. Since Q1-2 is off when the charger not charging or Vin goes away, it is not wise to allow any battery current to flow though Q1-2 via its parasitic diode. Excessive battery discharge current will easily destroy Q1.

Although this charger is not a Smart Battery charger, the battery connector follows the industry standard. Optional use of a Smart Battery will permit data-logging with the OPTIONAL DC1223 Demoboard via J2. To be clear, you do NOT need a Smart Battery or the DC1223 to use the DC1256A Demoboard. DC1223 is an SMBus-to-USB port adapter and comes with associated software to monitor a Smart Battery for demonstration or characterization purposes only. Contact your LT representative for ordering a DC1223.

This Demoboard is capable of supporting the LTC4012, and LTC4012-1 with a simple IC swap-out. The LTC4012-1 sets the per-cell voltage to 4.1V/Cell for Li-ion where as the 4012 is a fully adjustable version for all other battery chemistries such as SLA or the now popular Lithium Iron Phosphate (LiFePo). See schematic.

Design files for this circuit board are available. Call the LTC factory.

Table 1. As Shipped Performance Summary

PARAMETER	CONDITIONS / NOTES	VALUE
Maximum Input Voltage	Limited by Input Capacitor Volt Ratings.	20V
Charge Float Voltage	JP1 = 1-2 & JP2 = 2-3	12.6V +/- 0.5%
Minimum Input Voltage	Using a 12.6V Li-ion battery.	15V recommended
Input Current Limit	JP4 at 4A setting.	4 Amps +/- 3.2%
Maximum Charge Current	Vin ≥ Vbat +1.5V	3A +/- 4.2%

Table 2. Jumper Description

JUMPER	FUNCTION	RANGE/SETTING (DEFAULT)
JP1 & JP2	SETUP: Charge Float Voltage.	4.2V, 8.4V, (12.6V) & 16.8V
JP3	LED PWR. Used for eliminate status LED current drain on Vcc.	(ON) - OFF
JP4	INPUT: Selects the Input Current Limit (ICL) Trip point.	(4A) – 2A
JP5	VCC SELECT: Selects what power source for Vcc power. Internally via U2 or Externally via EXT VCC pin.	(INT) - EXT
JP6	INTERNAL VCC: Enables or Disable Vout as the input power source for U2 and optional DC410/DC1223 adapter boards.	(ON) - OFF
JP7	SHUTDOWN: Controls how LTC4012 will run when input power is provided. THM = Extra pin on battery connector is used as Battery Detection. See text.	OFF – THM – (ON)

Table 3. LED Status Indications

LED	FUNCTION (ONLY VALID WHEN ACP IS ON)	VALUE ON	VALUE OFF
C/10	Charge current has fallen to 1/10 of full scale. (Top off Charge mode)	Icharge <300mA	Icharge > 300mA
CHG	Charge current is above C/10. (Bulk Charge mode.)	Icharge > 300mA	Icharge <300mA
ICL	Shows that Input Current Limit (ICL) is active.	Iin > ICL	Iin < ICL
ACP	Indicates Vin is sufficient to start charging the battery. Does not guarantee battery will reach full charge unless Vin > Vfloat.	ON: Vin > Vbat.	OFF: Vin < Vbat

QUICK START PROCEDURE

1. Connect the input power source to VIN terminals J1 or VIN and GND using a power supply capable of handling 4.5A of current within a 13.5 to 20V range. The input supply voltage MUST be greater than the full voltage value of the battery to allow a full charge to take place.

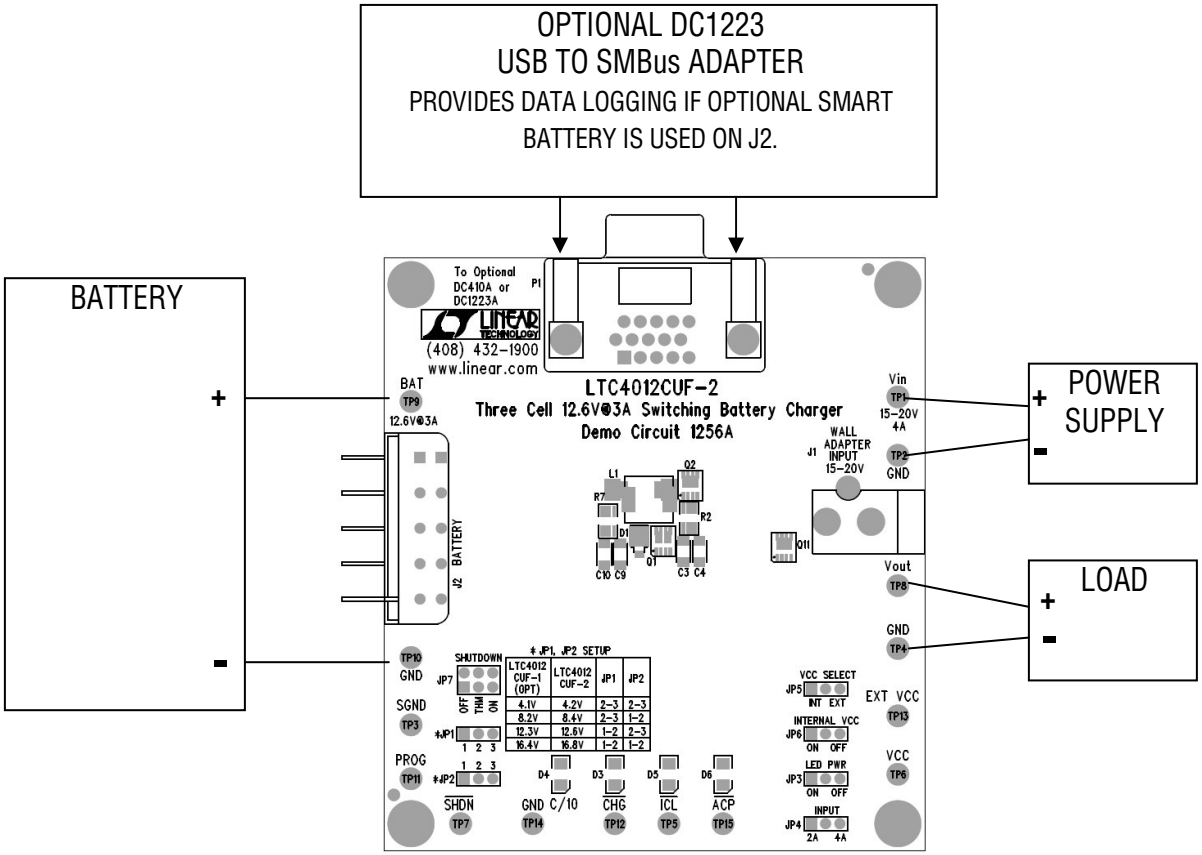
2. Connect the load to VOUT and GND terminals.

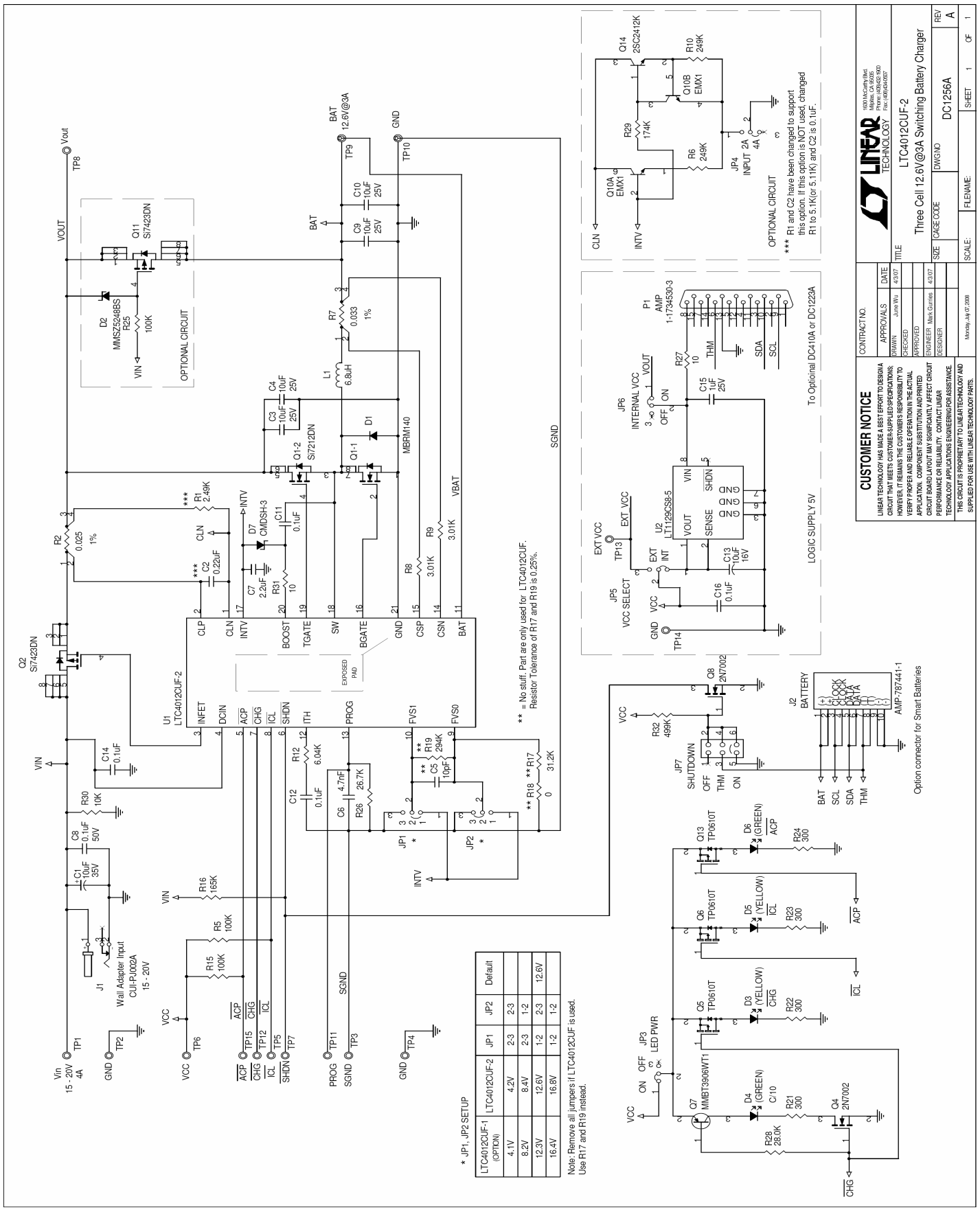
3. Configure the jumpers for your specific battery.

4. Plug in the battery. Industry standard 5 Pin AMP Smart Battery connector is provided as well as generic soldering Test Points for hardwire connections.

5. Turn on the input power supply.

6. Optionally use the provided DC1223A demonstration software to configure and communicate with the DC1256A.


OPTIONAL DC1223
USB TO SMBus ADAPTER
PROVIDES DATA LOGGING IF OPTIONAL SMART
BATTERY IS USED ON J2.
BATTERY
+
-
POWER
SUPPLY
+
-
LOAD
+
-
To Optional
DC410A or
DC1223A
P1
(408) 432-1900
www.linear.com
LTC4012CUF-2
Three Cell 12.6V@3A Switching Battery Charger
Demo Circuit 1256A
BAT
TP9
12.6V@3A
J2 BATTERY
Vin
TP1
15-20V
4A
WALL
ADAPTER
INPUT
15-20V
J1
TP2
GND
Vout
TP8
GND
TP4
TP10
GND
SGND
TP3
PROG
TP11
SHDN
TP7
GND C/10
TP14
CHG
TP12
ICL
TP5
ACP
TP15
VCC
TP6
EXT VCC
TP13
JP7
SHUTDOWN
OFF
THM
ON
JP1
JP2
VCC SELECT
JP5
INT EXT
INTERNAL VCC
JP6
ON OFF
LED PWR
JP3
ON OFF
INPUT
JP4
2A 4A
* JP1, JP2 SETUP
LTC4012 CUF-1 (OPT)
LTC4012 CUF-2
4.1V 4.2V 2-3 2-3
8.2V 8.4V 2-3 1-2
12.3V 12.6V 1-2 2-3
16.4V 16.8V 1-2 1-2


LTC4012CUF-2
Three Cell 12.6V@3A Switching Battery Charger
DC1256A
LINEAR TECHNOLOGY
CUSTOMER NOTICE
OPTIONAL CIRCUIT
LOGIC SUPPLY 5V
To Optional DC410A or DC1223A
Option connector for Smart Batteries
Wall Adapter Input
CUI-PJ002A
15 - 20V
* JP1, JP2 SETUP
Note: Remove all jumpers if LTC4012CUF is used.
Use R17 and R19 instead.
** = No stuff. Part are only used for LTC4012CUF.
Resistor Tolerance of R17 and R19 is 0.25%.
*** R1 and C2 have been changed to support this option. If this option is NOT used, changed R1 to 5.1K(or 5.11K) and C2 is 0.1uF.